In the foregoing example, measurement of the reference DTO and DFO was described for the purposes of determining the unknown DTO and DFO. It is not in fact essential to measure the reference DTO, although this leads to the greatest accuracy. It is possible and adequate for some purposes to measure the unknown DTO directly by CAF processing. Alternatively the reference DTO may be determined by geometry from the locations of the reference transmitter **22** and the relay satellites **14** and **16**. However, for all practical purposes it is necessary to measure the reference DFO to determine the unknown DFO; this is because the required accuracy of DFO measurement is in the order of Hz$\times 10^{-3}$, and use of the measured reference DFO compensates for an error in this measurement in the order of several Hz introduced by the relay satellites **14** and **16**.

I claim:

1. A method of locating the source of an unknown signal received by a plurality of signal relays, the method including the steps of:

(a) arranging for a plurality of receivers to receive the unknown signal from respective signal relays;

(b) arranging for the receivers to receive respective reference signals from respective signal relays, the reference signals either being replicas of a single signal or being replicas of signals locked in frequency, time and phase to a single signal and the reference signals being transmitted to the signal relays from reference transmitting means of known location;

(c) separating the respective unknown signal and reference signal received by each receiver from one another and processing them coherently to preserve their timing and phase information relative to each other;

(d) performing cross ambiguity function processing of the processed reference signals and the processed unknown signals and employing the processed reference signals to counteract phase noise and frequency drift effects in the unknown signals in order to determine at least one of the following:

(i) values of the Differential Time Offset (DTO) and Differential Frequency Offset (DFO) of the unknown signals;

(ii) values of the DTO of the unknown signals corresponding to different signal relay positions,

(iii) values of the DFO of the unknown signals corresponding to different signal relay positions,

(iv) values of the DTO of the unknown signals corresponding to different combinations of signal relays,

(v) values of the DFO of the unknown signals corresponding to different combinations of signal relays.

2. A method according to claim **1** wherein processing in Step (c) is carried out in respect of signals received by each receiver by downconverting the unknown signal and the reference signal to intermediate frequency (IF) signals with predetermined bandwidths and obtaining digital samples thereof with sample timing and downconversion controlled in accordance with a precise frequency and timing standard.

3. A method according to claim **2** wherein the unknown and reference signals have IF bandwidths not greater than 4 MHz.

4. A method according to claim **3** wherein the DTO of the unknown signals is determined and the unknown signal has an IF bandwidth which is at least close to its bandwidth prior to downconversion.

5. A method according to claim **3** wherein the DFO of the unknown signals is determined and the unknown signal bandwidth is matched to the reference signal bandwidth.

6. A method according to claim **3** wherein the DFO of the unknown signals is determined and the unknown signal IF has a bandwidth of less than 100 kHz.

7. A method according to claim **6** wherein the unknown signal IF has a bandwidth substantially equal to 10 kHz.

8. A method according to claim **1** wherein cross ambiguity function processing in Step (d) includes the step of producing complex data from real data by a Hilbert transform procedure.

9. A method according to claim **1** wherein cross ambiguity function processing in Step (d) is performed to determine reference signal DTO.

10. A method according to claim **9** including the steps of:

(a) finding a preliminary value of the reference signal DFO by evaluating the cross ambiguity function for a range of trial frequency offsets until a function maximum is obtained indicating that the relevant trial frequency offset is the required preliminary value;

(b) transforming first and second reference signals associated with respective receivers to frequency domain equivalents thereof;

(c) frequency shifting the first reference signal relative to the second reference signal in the frequency domain, the frequency shift consisting of the preliminary value of DFO;

(d) excising any unwanted frequency components in the frequency domain reference signals;

(e) in the frequency domain, multiplying the complex conjugate of each frequency component of the first reference signal by the corresponding frequency component of the second reference signal to produce frequency component products;

(f) transforming the frequency component products to the time domain and producing a respective value of the cross ambiguity function for each of a range of values of relative time offset between the first and second reference signals;

(g) selecting a set of the largest magnitude values of the cross ambiguity function, obtaining a maximum value of the magnitude of the cross ambiguity function by interpolation therebetween, and deriving the reference signal DTO as the relative time offset between the first and second reference signals which corresponds to that maximum value.

11. A method according to claim **1** wherein processing in Step (d) is carried out to obtain the reference signal DFO and includes the steps of:

(a) determining the DTO between first and second reference signals associated with respective receivers;

(b) introducing a relative time shift between the first and second reference signals equal to the reference signal DTO;

(c) sampling the reference signals after the relative time shift;

(d) multiplying the complex conjugate of each first reference signal sample by a corresponding sample of the second reference signal to produce time component products;

(e) Fourier transforming the time component products to the frequency domain and producing a respective value of the cross ambiguity function for each of a range of values of relative frequency offset between the first and second reference signals;

(f) selecting a set of the largest magnitude values of the cross ambiguity function, obtaining a maximum value of the cross ambiguity function by interpolation therebetween, and deriving the reference signal DFO as the relative frequency offset between the first and